EXHIBIT 3

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF MICHIGAN
SOUTHERN DIVISION

In re Flint Water Cases	Civil Action No. 5:16-cv-10444-JEL-MKM (consolidated) Hon. Judith E. Levy Mag. Mona K. Majzoub
Elnora Carthan, et al. v. Governor Rick Snyder, et al.	Civil Action No. 5:16-cv-10444-JEL-MKM

REBUTTAL DECLARATION OF CLIFFORD P. WEISEL, M.S., Ph.D.

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I. INTRODUCTION

I, Clifford P. Weisel, M.S., Ph.D., state and declare as follows:

1. I submit this Rebuttal Declaration in response to reports that have been presented as proposed expert opinions offered by the Veolia and LAN Defendants in this case (specifically, the reports of Drs. Finley, Roy, and Greenberg)[1,2] and in further support of the opinions presented in my expert declaration of October 14, 2022 and my deposition testimony concerning the same.

2. In my October declaration, I presented four primary opinions:

   a. My opinion is that persons who are currently adults and consumed unfiltered tap water over a period of at least 90 days in Flint at homes, recreational facilities, workplaces, restaurants, and schools

[1] In this declaration, I address the primary criticisms presented by the Defense reports that responded to my initial report. However, the Defense reports totaled several hundred pages and the materials upon which those reports were based were not contemporaneously produced. Failure to rebut all statements proffered by the Defendants in their voluminous reports is not an indication that I agree with those statements not specifically addressed.

[2] At the time my rebuttal declaration was served in this case, October 18, 2022, there were nine questions certified for trial by the Court. Shortly thereafter, on October 26, 2022, it is my understanding that the certified questions were condensed and modified to five. The original question I addressed was: "Were the corrosive water conditions allegedly caused by Defendants capable of causing harm to Flint residents, property, and businesses?" The new related question is: "Were the harmful water conditions capable of causing harm to Flint residents, properties, and businesses?" This change has no impact on my original analysis, nor any of the conclusions presented in my prior reports.

between April 25, 2014 and October 16, 2015 ingested increased concentrations of lead as a result of Flint's change in water to the Flint River.

b. It is my opinion that the failure to use appropriate corrosion control treatment when or shortly after the water source for Flint was switched on April 25, 2014 caused a disruption of the protective layer on the surface of pipes and plumbing fittings and fixtures resulting in soluble and particulate lead in the tap water in homes, recreational facilities, workplaces, restaurants, and schools.

c. It is my opinion that homes, recreational facilities, workplaces, restaurants, and schools that had lead service lines, galvanized steel service lines with connectors containing lead, or interior plumbing that had lead solder or other lead containing fittings and fixtures (i.e. structures built prior to 1986 that did not have complete plumbing upgrades) would have increased lead in their tap water because of the corrosivity of the water resulting from the change of water source on April 25, 2014.

d. It is my opinion that water lead levels were elevated in Flint between May 1, 2014 and October 16, 2015 in homes, recreational facilities, workplaces, restaurants, and schools if they had service lines or

interior plumbing whose properties make them a likely source of lead. Further, that opinion would be true even if a single or small number of water samples collected in those buildings measured below the lead minimum reporting limit since water lead levels vary with time and depend upon the sampling conditions used.

II. REBUTTAL RESPONSES

1. Applicability of My Opinions to the Class Period of February 10, 2015 through October 16, 2015.

In my initial report, I provided the opinions summarized above for the full class period and specifically opined that water lead levels were elevated in Flint between May 1, 2014 and October 16, 2015. Some of Veolia's proposed experts critique this finding with respect to the shorter duration of time associated with Veolia's involvement in the Flint Water crisis between February 10, 2015 and October 16, 2015. (*See*, e.g., Finley Report at p. 39). Additionally, Dr. Roy suggests, based upon biosolid data, that "more than three quarters of the extra lead release to water captured in biosolids during the water crisis versus an identical 18-month period before the water crisis, occurred during June-August of 2014." (*See* Roy Report at p. 12).

My opinions finding exposure to elevated levels of lead in Flint water remain valid for the narrower period of February 10, 2015 through October 16, 2015 (the

Veolia period). The documented change in the quality, and corrosivity of, Flint's water supply resulting from switching the source water from the Detroit water system to the Flint River on April 25, 2014 remained applicable during the Veolia period. These changes caused lead to be released from the lead service lines, galvanized service lines, and from indoor plumbing fixtures containing lead. [redacted]

The delay in switching back to Detroit (Huron Lake source) water and boosting orthophosphate dosing until after October 2015, resulted in continued excess lead being released into the tap water of households and other locations in Flint during this time period, and therefore exposure to those residents who consumed unfiltered tap water there. This is evident from the results reported by Pieper et al. 2018 (their Table S1) where the median 1st draw WLL measured across 268 homes was 3.5µL in August 2015, while Flint River water was still being used, compared to 1.9 µL, a 50% decline, across 186 homes in March 2016 and 1.2µg/L, a three-fold decline across 176 homes in July 2016.[3] The 90th percentile Water Lead

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[3] Pieper, K.J., R. Martin, M. Tang, L. Walters, J. Parks, S. Roy, C. Devine and M.A. Edwards (2018). "Evaluating Water Lead Levels During the Flint Water Crisis." Environmental science & technology **52**(15): 8124, at 8125.

Level in August 2015 was 26.8 µg/L and by July 2016, had declined by 43% to 15.1 µg/L. Thus, delaying the switch back to a Lake Huron water source and use of adequate organophosphate during the Veolia period of February 10, 2015 through October 16, 2015 resulted in additional lead exposure to individuals who consumed Flint tap water during that time period.

2. <u>Further Response to Dr. Finley.</u>

The statement on page 8 of Dr. Finley's report "In fact, detectable WLLs were present in tap water in homes throughout Flint for years before the switchover" is not correct. The figure provided by Finley from Roy and Edwards (2020) are ***hypothesized*** 90th % Water Lead Levels back-calculated from Biosolids-Pb and ***not measured detectable WLL concentrations from tap water*** in homes in Flint. There was no measurably detected lead in water lead levels in Flint from the years 2008 through the period immediately prior to the switchover (Aug-14-2019 EGLE002604). The potential problems with the approach used by Roy et al. (2018) and Roy and Edwards (2020) to ***estimate*** WLL90 levels from Biosolids-Pb are discussed in detail in response to the Roy declaration. But Dr. Finley's characterization of these ***estimates*** as actual detected water lead levels from the taps of the homes of people in Flint is misleading.

Further, issues have been raised with the home selection and how the LCR samples were collected by the City of Flint in 2008, 2011 and 2014-15 which would

have resulted in them being biased low. Roy et al. (2019) indicated that the LCR samples collected by the Flint water authority in 2014-2015 did not follow EPA protocols by preflushing the homes the evening before the 6-hour stagnation time and using small mouth bottles.[4] Even with the sampling protocol deviations, the majority of the LCR samples collected in 2014-2015 had Water Lead Levels above the detection limit, including six of the eleven homes that had been sampled in 2008 and/or 2011. This indicates that measurable WLL can be obtained using the sampling protocols followed, though the levels were likely lower than if the LCR protocols were followed.

The increased leaching from the service lines and indoor plumbing due to the corrosivity of the water during 2014-2015 is, more likely than not, the reason for homes to have measurable lead values in the Flint LCR samples while those in 2008 and 2011 did not. If similar corrosive water was present in the pre-event samples taken by the City of Flint in 2008 and 2011, provided the same sampling protocols were used as in 2014-15, one would have expected measurable lead levels in those LCR samples as well.

Dr. Georgopoulos's modeling predicts incremental increases in blood lead levels ("BLL") for increases in the WLL due to the corrosivity of the Flint water and

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[4] Roy, S., Tang, M., and Edwards, M.A., (2019) Lead release to potable water during the Flint, Michigan water crisis as revealed by routine biosolids monitoring data, Water Research, 160, 475-483.

not the actual BLL for any specific individual. Thus, if the pre-changeover WLL were actually higher, than 1 μg/L, the calculated increased BLL for increased WLL present in the post-changeover Flint water would still be additive to a higher baseline BLL. (*See*, e.g., Rebuttal Declaration of Howard Hu, M.D., M.P.H., Sc.D.; p. 20-21; March 25, 2021).

In neither my declaration nor my deposition was the water in the years immediately prior to the changeover referred to as "pristine", as indicated by Finley on page 22. Rather it was stated that the only water samples collected for lead measurements identified for the years immediately prior to the switchover were the City of Flint LCR water samples collected in 2008 and 2011, and that all of those samples reported no detectible WLL (Aug-14-2019 EGLE0002604). In the absence of other data, these were selected as the baseline water concentration prior to the switchover for calculating the change in blood lead levels that would be associated with increases in Water Lead Levels across the range reported for Flint after the switchover.

Independent of the WLL levels being below the detection limit or at a higher value, the corrosivity of the water due to the switchover caused lead to be released from lead and galvanized service lines and indoor plumbing containing lead. This would increase the WLL at those homes and other locations compared to their pre-changeover WLL, and for those ingesting that water higher lead ingestion exposures

after April 2014, including during the narrower Veolia time period. The ingestion of that water would lead to increased blood lead levels for those individuals, compared to the levels expected if the switchover had not occurred or if steps had been taken sooner to reduce the water's corrosivity and/or warn the community not to drink the water. The blood lead increase would depend upon how much additional lead was in the Flint water and the volume and duration of water consumption, as indicated in the declaration of Dr. Georgopoulos.

As explained above, the statement on page 21 of Dr. Finley's report that "detectable WLLs were present in tap water in home throughout Flint for years before the switchover" is not correct. Dr. Finley does not cite any data source that reported water lead levels in the years immediately preceding the Flint water crisis. Rather he refers to levels that were estimated, based on Biosolids-Pb measurements that were used to back-calculate hypothesized WLL90 (90^{th} percentile) of between 15 and 30 μg/L. There were no reported detectable levels of lead for any home that was sampled in the two sets of LCR measurements in the years prior to the switchover (2008 and 2011). *See*, Aug-14-2019 EGLE002604. As will be described in the following subsection, when discussing the expert report of Dr. Roy, there are several issues with the estimated WLL90 from the Biosolids-Pb and those estimated WLL90 were biased high.

3. **Response to Declaration by Dr. Roy.**

Dr. Roy indicated that the two papers he co-authored were subject to Peer Review and described the Peer Review process. That process is used to determine the suitability of a paper to be published in a journal. This is done by the journal's editor and reviewers who evaluate whether a paper's content is within the scientific scope of the journal, adds to the scientific knowledge, uses acceptable methodology, and provides a plausible explanation for the results it portrays. However, peer review does not guarantee that the results are valid, or the best explanation of the phenomenon being studied. Peer review studies interpretation may change upon further evaluation, as additional information becomes available or further studies are done. When a peer review study reports a novel hypothesis and methodological approach, as Roy and his co-authors claim for their use of routine lead measurements in biosolids to estimate lead water levels in homes, it is typical that additional scientific studies are done before the reported approach and results are considered definitive. To assess whether the methodology employed by Roy has been replicated, I reviewed the literature cited in those two articles on 2/13/23. None of those scientific papers reproduced the proposed methodology of using routine metal analysis in biosolid waste to estimate metal drinking water concentrations. Thus, the proposed methodology has yet to be replicated at other locations, though the initial paper has only been published slightly more than three years ago, so additional

research using this approach may not have been completed or published. In my review of Roy's 2019 and 2020 papers, I have identified several statements and analyses that suggest the estimated WLL90 that Roy hypothesizes, including for the years immediately prior to the Flint water crisis, are biased high and that there is greater uncertainty in their estimates than indicated in the paper. The reasons for this are outlined in the following subsections.

First, in point 24 of Dr. Roy's declaration, he refers to the Roy et al. (2019) paper and states that there are five limitations to using the lead amounts in biosolids to estimate the Water Lead Levels in Flint. He suggests that none of those limitations existed for the Flint sewage system. Two of those limitations, which he says did not exist in Flint are: "d) combined sewer systems that transport both urban runoff (e.g., from rainfall or hydrant flushing) and domestic wastewater", and "e) significant presence of lead and heavy metals in effluents discharged by industry."

4. **Heavy Precipitation and Flint's Sanitary Sewer System.**

For limitation d) combined sewer systems that transport both urban runoff (e.g., from rainfall or hydrant flushing) and domestic wastewater – the paper by Roy et al. (2019) cites several sources to support the stipulation that "In terms of possible confounding factors, the stormwater in Flint is not discharged to sewers, reducing the likelihood that surface water runoff or hydrant flushing of water would influence the results". Although Flint's sewer systems are nominally "separated", as opposed

to one "combined" system, it is clear that during heavy precipitation events, stormwater infiltrates significantly into the sanitary sewer system in Flint. A review of annual MDEQ (or EGLE) reports of sanitary sewer overflows (SSOs) records that, in some years, Flint leads the state in the volume of sanitary sewer overflows of combined sanitary and raw sewage that are discharged directly to the Flint River. A summary of those annual events is collected at Exhibit 1 to my report. The infiltration of large volumes of stormwater, and the variability of large precipitation events from year to year can affect the variability and reliability of the Biosolids-Pb measurements that are used by Roy to back-calculate estimated lead levels in drinking water.

The reports summarized in Exhibit 1 indicate that while Flint, MI does not operate a combined sewer, since it has separate sanitary sewer (domestic) waste and storm water lines, it has experienced sanitary sewer overflows (SSOs) and under heavy wet conditions water from the storm water lines or from infiltration and inflow (I&I) combine with the sanitary sewer flow at the treatment plant. The variability in SSOs from year to year can impact the biosolids produced at the waste treatment plant. Roy's failure to account for this variability negates his statement that "Flint's stormwater was not discharged into sewers" (Roy Report, ¶26). Rather the stormwater infiltration and inflow into sanitary sewers contribute to the biosolids mass and potentially the lead in the biosolids and will impact the temporal variability

of biosolids. Thus, this data source does not confidently predict WLL in Flint water system.

Additional reports that discuss the presence of Sanitary Sewer Overflows in Flint include:

a) www.cityofflint.com/wp-content/uploads/2022/07/5696-01-EA-Flint-w-map-4-29-2020-1.pdf

This report indicates that while Flint, MI has separate wastewater flows and storm water flows "there can be significant infiltration and inflow contribution to the collection system and WPCF *(water pollution control facility)* for treatment particularly during wet weather events. The WPCF is located in the northeast corner of Flint Township at the corner of Beecher Road and Linden Road. … Wet weather event can increase flow to WPCF in excess of 9 MGD *(million gallons per day)* which results in storage of wastewater in the RTB *(retention treatment basin)* and the deep sewer tunnel connected to the EPS *(east pump station)*." The WPCF is where the treatment of the sewage is done, which includes solid handling. In addition, the Flint wastewater treatment system is a regional system that accepts sewage flow from neighboring townships and cities. Thus, the lead concentration in the biosolids can be impacted by wastewater from townships other than Flint, which was not accounted for in the paper by Roy et al. (2019) or Roy and Edwards (2020). This report also indicates that Flint's Wastewater Treatment Systems have been altered on several occasions over the last decade. In 2020, a series of improvements

to the Flint Wastewater Treatment System were proposed to deal with treating water for heavy wet events, along with other modifications to the treatment facility, indicative that SSOs were a known problem in Flint when Roy et al. published their paper. The report also states that there were changes in how the Flint WWTP biosolids were processed at the facility starting in 2016. These modifications included construction of a new solids loading facility in 2016 to move the solids into trucks. It is not indicated whether this modification affected the dewatering and drying of the sewage, which could also alter the reported lead concentration in the biosolids over time.

b) https://www.cityofflint.com/water-pollution-control/

The City of Flint Water Pollution Control (WPC) web page includes the statement: *"When it rains, much additional flow may reach the plant. WPC has the ability to hold about 20 million gallons of the excess water temporarily in a large storage basin. However, once the tank is full, the excess flows must be discharged. Before this water is discharged, excess flows are settled and disinfected with a bleach solution. All water discharged must be checked for quality and meet rigorous standards set and enforced by the Michigan Department of Environmental Quality and the U. S. Environmental Protection Agency."* These statements indicate that under heavy rain conditions the storm water is treated in the same facility as the domestic sewage material contributing to the biosolids. The website also indicated

that in 2009 the treatment process for the solids began to incorporate a reduction of sludge volume by implementation of an anaerobic digestion process, and a second change was initiated in 2015 whereby the water pollution control shifted from dewatering and incinerating the biosolids in favor of landfilling. Depending on when in the process the biosolid samples were collected for metal analyses, the reported lead concentrations on a per weight basis and mass of biosolids would differ as these different disposal and treatment processes were implemented. How these changes affect the lead measurements are not discussed by Roy in his papers or declaration, rather there is the inherent assumption in that paper that the treatment, collection, and measurement of lead in the biosolids did not change over the time period being considered.

c) https://docslib.org/doc/6441486/michigan-department-of-environmental-quality

The Michigan Department of Environmental Water Quality, Combined Sewer Overflow (CSO), Sanitary Sewer (SSO) and Retention Treatment Basin (RTB) Discharge 2013 Annual Report (January 1, 2013 – December 31, 2013, page 26) indicates that Flint had 335.9 Million Gallons of Total Volume of Sanitary Sewer Overflow (SSO) over 5 events in 2013, the most of any facility reported in the state. These overflows are related to wet events where the storm water flow combines with the sanitary or domestic sewer flow.

The Roy et al. (2019) paper acknowledges that the lead peak in the calculated WLL90 April/May - 2011 coincided with a heavy rain event which could affect the biosolids deposition and lead content by saying: “We speculate that this anomaly may have somehow been linked to treatment upsets or other events during record Detroit rainfall, which was national news in that exact time period (Bienkowski, 2013).” The monthly averages for April and May 2011 were 5.47 and 7.61 inches (https://www.weather.gov/wrh/Climate?wfo=dtx). May 2014, another month with high lead levels in the biosolids, also had a high monthly rainfall of 7.21 inches. Thus, variations in rainfall needs to be considered when interpreting the lead biosolid data, which was not done by Roy.

5. Industrial Source Discharges.

Roy also identifies as one of the limitations to his biosolids methodology whether there is a “significant presence of lead and heavy metals in effluents discharged by industry” but discounts that issue as it relates to Flint. (Roy Report, ¶¶24 and 26). Roy apparently ignores this issue based upon communications with City of Flint WWTP Supervisor Robert Case. See, Roy et al. (2019) citing Case, R., 2018. Personal Communication with Robert Case, City of Flint WWTP Supervisor on Jul 2, 2018 and Dec 3, 2018. Roy relies upon these personal communications to say, “In Flint less than 5% of the wastewater is derived from industry, which has largely eliminated its lead sources (Case, 2018).” I do not have access to Roy’s

personal communication. However, in documents produced by Virginia Tech, [redacted] These emails indicate that Robert Case suggests a measurable portion of the biosolids and possibly lead is from manufacturing, which is different from what is quoted by Roy et al. (2019).

The largest industry in Flint is General Motors (GM), which has three plants: GM Flint Assembly Plant, GM New Body Shop, and GM Flint Engine Operations. Operations at these facilities have been subject to significant variations over the

period of time addressed by Roy. The Assembly Plant produces GM trucks. A new paint shop was added in the beginning in 2014 and completed in 2016 at a cost of $79 million and encompassed a 1.5 million square foot building. (www.mlive.com/news/flint/2017/10/general_motors_invests_79m_for.html). The GM New body shop consists of an 883,383 square foot facility, that was constructed in 2016-2018 with connections to the Metal Center at a cost of $877 million. (www.freep.com/story/money/cars/2015/08/04/gm-invest-877m-new-body-shop-flint-truck/31097717/).

The GM Engine Operation plant produces engine platforms for small gas engines and turbo diesel engines. In 2011, $84 million was invested to expand production of 1.4 L engines; in 2013, $215 million for the new Ecotec gasoline engine; and in 2015, $263 million for a new engine line (https://gmauthority.com/blog/gm/gm-facilities/gm-usa-facilities/gm-flint-engine-plant-flint-michigan-usa/).

According to water billing records, the GM plants use an average of 722 hundred cubic feet (CCF) of water daily (Michigan Department of Environmental Quality, Water Reliability Study, City of Flint Draft April 27, 2016, COF_FED_0365479), which is approximately 7% of the total water billed by the Flint Water system. The processes at GM facilities contribute to the waste stream and would be expected to contain lead from the metal parts being processed. In 2010,

GM had a Pollutant Discharge Limit for how much lead could be contained in its discharge to the City of Flint sanitary sewage system of 0.107 mg/L (Revised Sewer Use Permit # 1-05-12-04-C011. GM000000179). Since different facilities were brought online at different times and the number of vehicles or engines produced are expected to vary within and over the course of years, the industrial contribution of water used and disposed through the sanitary sewer system by the GM facilities can be expected to vary over time.

Several months after the 2014 water switch, General Motors stopped using Flint river-sourced water due to its high corrosivity which corroded the engine parts produced at the GM plant. GM could not overcome the corrosivity of the water with an expensive reverse osmosis system added to purify the water or by trucking in water to dilute the chloride levels. This changed the potential lead release by GM into the sanitary sewer system, with higher levels expected starting after the April 2014 switchover, when the higher corrosivity water began in the Flint water system. In October 2014, GM reached an agreement with the town of Flint to switch from Flint water back to a Lake Huron water source. However, GM "noticed it some time ago (and) the discussions have been going on for some time." (*i.e. that the water was found to corrode their metal parts and possibly altered the production at the plant as well as the amount of effluent to the waste stream prior to October 2014 when GM switched away from Flint water.)*

(https://www.mlive.com/news/flint/2014/10/general_motors_wont_use_flint.html).

The problems associated with the more corrosive water would likely have altered the metals content in the discharge effluent by GM between April and October 2014 and the release of lead in the wastewater from GM facilities contributing to the peak shown in Figure 1 of Roy et al. (2019). Yet this change in GM water use and discharge practices is not reflected in Roy's analysis.

6. **Criminal Discharges to the City of Flint's Sanitary Sewer System.**

Roy's analysis also does not evaluate the prospect of criminal dumping of industrial wastes into Flint's sanitary sewers. As one example, an additional non-residential source to the sanitary sewage system was illegal dumping of wastes by Oil Chem, Inc. The company owner plead guilty to discharging oily industrial wastewaters and landfill leachate into the sanity sewer between January 2007 and October 2015. The company processed more than 47 million gallons of leachate over this time period which was routinely directed to the sanity sewer system and discharged to Flint's POTW (Publicly Owned Treatment Works). (Finley Dep., Ex. 10). This source of solids and lead was not accounted for by Roy et al. (2019).

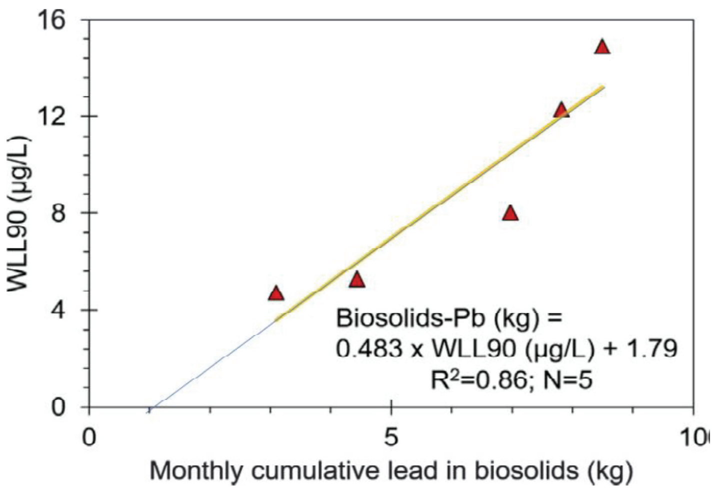
Thus, the limitation of not having industrial sources that were variable is not valid.

7. Issues with the Regression Analysis for the Hypothesized WLLs and BLLs Performed by Dr. Roy.

A major conclusion of Roy et al. (2019) and Roy's report is that the WLL90 values can be estimated from Biosolid-Pb content. This was done by fitting 5 pairs of data points of monthly cumulative Biosolid-Pb (kg) with the average of the WLL90 levels from 1st, 2nd and 3rd draw samples collected as part of a citizen science collaboration in August 2015, March 2016, July 2016, November 2016, and August 2017, offset by one month (Figure 2, Roy et al. (2019)). The one-month offset was selected to account for the two-week retention time of biosolids in the treatment plant. The regression was considered to have a "very strong" linear correlation, with an equation of Biosolids-Pb(kg)=0.483xWLL90(μg/L)+1.79 and an R^2=0.86. However, a linear regression and correlation based on only 5 data points (an n=5) is statistically suspect. Scientifically, it is recommended for data with a high variance, which these data have, that at least 25 to 30 data points should be used when calculating a regression and correlation. Even data with well controlled data sets and low variances, should use at least 8 data points. (Fraenkel, J. R., & Wallen, N. E. (2008). How to design and evaluate research in education. (7th ed.); and Jenkins and Quintana-Ascencio 'A solution to minimum sample size for regressions' PLOS One February 21, 2020 https://doi.org/10.1371/journal.pone.0229345). The regression analysis done by Roy et al. (2019) does not follow these scientific statistical guidelines. Regressions using very small sample sizes (typically between 3-6 data

points, as is the case here) can result in a false positive relationship with a high R^2. Further, regression equations based on very small data sets are weighted to the largest value(s) and result in high uncertainty in predicting the dependent variable (WLL90) at lower values of the independent variable (Biosolid-Pb(kg)).

In addition to not following good scientific, statistical principles, the shape of the actual data points does not visually appear to be a single linear line, though the low number of data points presents difficulty in determining the true shape of the curve. The apparent flattening of the curve at the lower values would result in a large uncertainty when estimating values near the lower limit of the regression line. For these data, the two lowest data points have WLL90 values of 4.7 and 5.3 µg/L, a 12% difference, while the Biosolid-Pb values are 3.1 and 4.5 kg, a 37% difference. For a true linear association, the percent differences should be the same. When the trend line from Figure 2 in the Roy et al. (2019) paper is extended to the x-axis, as shown below, it appears to have an x intercept of 1.0 not the 1.79 in the regression



equation. When I used Excel to examine these data, the trend line equation produced by Excel for the figure was WLL90(µg/L)=1.78xBiosolid-Pb(kg)-1.93, which is equivalent to Biosolids-Pb(kg)=0.56WLL90(µg/L)+1.08, giving the intercept for the trend line observed. When I ran the regression by switching WLL90(µg/L) to the x-axis as the independent variable and Biosolid-Pb(kg) to the y-axis as the dependent variable, the equation generated by Excel for the trend line is as reported in Roy et al. (2019) of Biosolids-Pb(kg)=0.482xWLL90+1.79. The reason for the difference in the regression equations depending upon which variable is assigned to the x or independent variable and which the y or the dependent variable is that the data do not fit a linear relationship. Thus, using the linear regression given in Roy et al. (2019) to predict WLL90 values from the monthly cumulative lead in biosolids is not correct.

The paper by Roy and Edwards (2020) gives a different regression equation of Biosolids-Pb(kg)=0.37xWLL90(µg/L)+1.41, without providing the R^2 or the number of data points used to determine that regression. This regression was calculated using the average of the 1st draw and the 1-minute flush instead of the average of the 1st draw, 1 minute flush and 2-minute flush. It is unclear whether additional data beyond the five sampling points used by Roy et al. (2019) (based on Pieper et al. (2018)) were used. When I calculated the five-point regression fit based on the 1st draw and 1-minute flush data from Pieper et al. (2018), the regression

equation using Biosolids-Pb(kg) as the x or independent variable and WLL90 as the y or dependent variable was Biosolids-Pb(kg)=0.42xWLL90(μg/L)+1.25, with the data again not visually fitting a straight line. The equation from the Roy and Edwards (2020) paper of Biosolids-Pb(kg)=0.37xWLL90(μg/L)+1.90 was obtained by switching the variable, indicative that regression they generated was using just the 5 original data points even though they now had more data available. Again, using the linear regression for these data in the Roy and Edward (2020) paper is not correct.

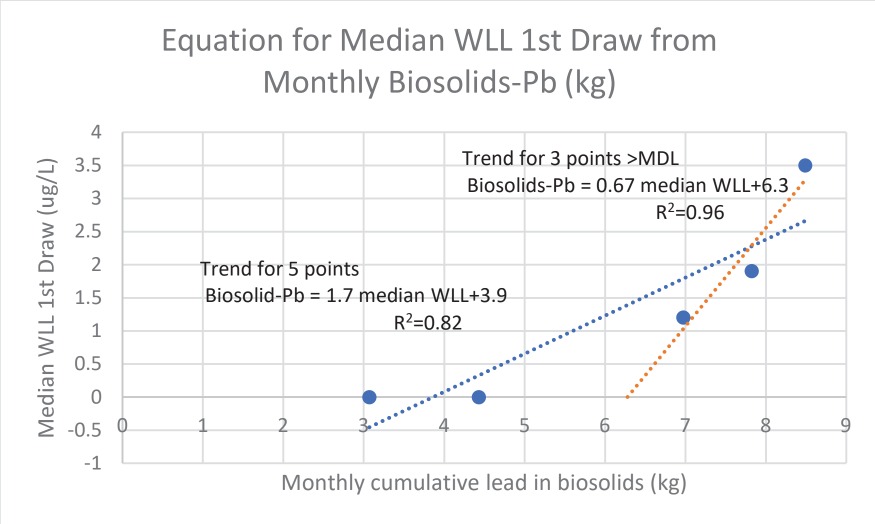
These regression lines were also used to estimate the non-residential water contributions to the lead based on the x-intercept of the line (i.e. the Biosolids-Pb value when the WLL90 equals zero) (Roy et al. (2019) and Roy and Edwards (2020)). Besides the issues discussed in the previous paragraph, the estimate, of 1.79 Biosolids-Pb (kg) has a number of assumptions that increase its uncertainty. First, the WLL90 measurements were offset from the biosolid measurements by one month, to account for a biosolids retention time at the plant of approximately two weeks. While the biosolids were scheduled to be collected early in the month, with 77% between the 1st and the 6th of the month, it was not indicated whether, for the five months that were used, they were collected in the beginning of the month or at a different time of the month. Similarly, the time period during each month when the water samples were collected is not specified. Thus, it is not known if the one-month lag used was appropriate for these five sample pairs to be approximately two weeks

apart, as suggested by the resident time of the biosolids in the facility reported in Roy et al. (2019).

Not matching the WLL90 values and monthly Biosolid-Pb levels correctly will greatly affect the regression calculated and the R^2 fit since the monthly Biosolid-Pb levels varied greatly from month to month. For example, the August 2015, September 2015, and October 2015 Biosolids-Pb monthly accumulation (kg) were 10.1, 8.48 and 5.91 kg, and for March 2016, April 2016, and May 2016 they were 4.98, 7.82 and 7.28, indicative of how variable these values are. There is no discussion of the uncertainty of the predicted WLL90 from the Biosolids-Pb due to mismatching of those data in the Roy et al. (2019) paper or Roy's declaration. Presumably, the actual dates of the water samples and the biosolid composites were known, so a more accurate match could have been done.

Roy et al. (2019) and Roy and Edwards (2020) stated that regression line intercept "might represent a portion of lead loading to the sewage plant per month independent of that released from plumbing", presumably from households in Flint. This is not correct for the regression line they generated; even if it had been correct, since WLL90 only includes a portion of the homes that participated in the citizen science project reported in Pieper et al. (2018), the 90th percentile WLL among homes would not include lead released from household plumbing from the majority of residences in Flint. As Roy and Edwards (2020) state, the WLL90 "identify a

characteristic level of water lead in 'worst case' homes, and does not reflect average or total lead release to water across the entire city." Further, the biosolids at the Flint WWTP include material from residences in the surrounding communities that rely on the Flint sanitary sewer treatment plant for their wastes. If the regression analysis actually had sufficient number of data points to be statistically valid, plotting the Biosolids-Pb values with mean or median WLL rather than the WLL90 would provide a better estimate of the non-Flint plumbing contributions. For comparison purposes, the figure below uses the median 1st draw WLL reported by Pieper et al. (2018), rather than the average WLL90 of three water draws used by Roy et al. (2019), to calculate the Biosolids-Pb intercept when the WLL is zero, given the caveat that the data are not sufficiently robust to actually determine the regression association. These data provide an estimate of the Biosolids-Pb intercept of between 3.9 and 6.3 kg, for the non-Flint residential plumbing sources. These estimates are very different from that determined by Roy et al. (2019), (1.79 kg) since that value did not consider contributions from the majority of homes in Flint.



The figure shows two possible regression lines, one for just WLL values above the detection limit and a second that uses all five data points with the WLL set to zero when it was below detection. The shape of the data and R^2 values are similar to that in Figure 2 from Roy et al. (2019). One contribution to the Biosolid-Pb(kg) besides the homes in the Flint is from the GM plant. The potential contribution of lead to the biosolids from GM, the largest industry in Flint, can be estimated as the product of the amount of water purchased by GM, 722 hundred cubic feet/day or 2,040,000 L/day (Michigan Department of Environmental Quality, Water Reliability Study, City of Flint Draft April 27, 2016, COF_FED_0365479) and the legally permitted lead concentration in the effluent of 0.107mg/L (Revised Sewer Use Permit # 1-05-12-04-0011. GM000000178). This gives a release of 0.22 kg of lead/day into the sewer lines, which corresponds to 6.6 kg of lead/month. While this amount is at the legal limit that can be released and not a measured amount, it is

within the range extrapolated from the median WLL and more than three times the estimate used by Roy et al. (2019) and Roy and Edwards (2020) for non-Flint plumbing lead sources to the biosolids. That estimate does not include contributions from illegal dumping or storm drains, as discussed above, or from other townships that use the Flint Wastewater treatment plant. Therefore, assuming that all lead in the month biomass above the 1.79kg is from Flint household plumbing is in error.

Another inconsistency in Roy et al. (2019) is the statement: "Following the switch, the total mass of biosolids (dry weight basis) produced in May to July 2014 (average = 317 metric tons) was more than twice as high as the biosolids produced the prior year (May 2013-Apr, 2014; average=140 metric tons), before eventually stabilizing to precrisis levels after switching back to Lake Huron source water. (S2)" A visual examination of the levels of Figure S2 does show a peak in April-May 2014 that is about twice as high as the previous year, but it is not clear what the basis of the latter part of their statement is. The mean amounts of biosolids produced in 2012 and 2013 before the crisis were 133±16 and 147±38 metric tons, respectively, while in 2016 and 2017, after the crisis the means were 187±38 and 155±38 metric tons, respectively. A t-test indicated that total mass of biosolids were statistically lower during 2012-2013 compared to 2016-2017, p-value=0.003839. This contradicts the statement that the quantity of biomass stabilizing to precrisis levels.

Roy et al. (2019) figure 3 compares the %EBL5 (percent of blood leads exceeding 5µg/dL) across several time periods, but did so in a fashion that can easily be misinterpreted, since it does not group the samples by the same season. There is a known seasonal effect on children's blood levels, with EBL being higher in summer months than at other times of the year. (www.michigan.gov/mdhhs/-/media/Project/Websites/mdhhs/Folder2/Folder92/Folder1/Folder192/BLLs_in_FlintNORdactions.pdf?rev=1fbff8d1cf694bcb4bbf13b4e1816&hash=2113E07EBE8F0C69E2C0EA58BDDB39FD). Thus, plotting the five average %EBL5 values *(labeled as Pre-FWC) Nov 2012-Apr 2014, except Jul-Sept 2013), FWC (May 2014-Oct 2015, except Jul-Sept 2014), Pre FWC (Jul-Sep 2013), FWC (Jul-Sep 2014) and Post-FWC (Nov 2015-April 2017),* which includes two data points with just summer levels, two data points that include only fall through spring, and one data point that encompasses 18 consecutive months, against the corresponding average Biosolids-Pb does not provide a fair visual comparison. The text does correctly compare July–September 2013 to July-September 2014 and the authors state for that time period the %EBL was doubled, but the other %EBL should not be directly compared as the seasonal and population confounders are not accounted for.

The Roy et al. (2019) and Roy and Edwards (2020) papers' novel hypothesis used to estimate WLL90 in Flint based on monthly biosolids mass and lead content has multiple major flaws as described above. These flaws resulted in an inaccurate

estimate of the Flint WLL90 levels and the Flint non-plumbing lead contribution to the biosolid-Pb levels. That said, the Roy et al. (2019) paper still states “After the switchback in October 2015, the official lead in water data started meeting federal standards in late 2016”. This recognition that the WLL declined after the switchback in October 2015 implies that the water’s corrosivity in 2015 was elevating the WLL compared to that after the water switchback and individuals who ingested Flint water prior to the switchback had a higher lead exposure because of the water’s corrosivity in 2015. Based on WLL measurements the authors and their colleagues from Virginia Tech made in August 2015, the Virginia Tech group issued a warning in September/October 2015 not to consume Flint water and recommended that the Flint River not be used as a water source and a corrosive inhibitor be added to the water system (http://flintwaterstudy.org/information-for-flint-residents/results-for-citizen-testing-for-lead-300-kits/).

Roy and his colleagues have published multiple papers discussing the role of water corrosivity in Flint and on WLL, for example: “The absence of corrosion control and use of a more corrosive source increased lead leaching from plumbing.” (Pieper et al. (2018)), “When switching to treated Flint River water, city officials did not continue adding orthophosphate inhibitors …, the previously formed leaded scale layers began deteriorating and falling into the water…. Moreover, without these protective layers, lead-bearing plumbing was in contact with the corrosive Flint

River water, and the dissolution of lead from plumbing may have been occurring" (Pieper et al. (2019)), and "In contrast, the switch to Flint River water (with high chloride levels) and interruption of orthophosphate corrosion inhibitor dosing in Flint triggered the FWC. After switching back to Lake Huron water after the problems were acknowledged, the orthophosphate dose was tripled (compared to finished water received from Detroit) resulting in drastically reduced lead levels in Flint." (Roy and Edwards (2019)). Thus, Roy and his colleagues agree with my opinion that the corrosivity of the Flint water after the change-over caused lead to be released from lead and galvanized service lines and indoor plumbing and that lead release continued until water conditions stabilized following the water source being changed back to Lake Huron and the addition of anti-corrosion agents in October 2015.

8. Response to Dr. Greenberg

Dr. Greenberg indicates that my opinions are flawed and misleading because I failed "to apply quantitation to the concept of exposure". I did not provide a specific quantitation of exposure for any individual household in Flint in my declaration as I understood that an individual evaluation of specific exposure to individual residents is not at issue in addressing the general questions that have been certified by the Court for class litigation. Rather, my charge was to determine if there was an increase in lead exposure from consuming water in Flint because of the increased

corrosivity due to the change in water source on April 25, 2014 and, if so, whether that increase persisted through October 2015. I evaluated the water lead levels available before, during and after this period and the principles that govern lead release into water from service lines and plumbing due to the corrosivity of the water and determined that additional lead would be present in the water due to the change in water source over the time period of interest. [redacted]

Dr. Greenberg states that "he fails to define the factors that may eliminate or limit exposure to any given individual or group of individuals." I clearly state in my declaration that individuals needed to ingest water from homes, recreational facilities, workplaces, restaurants, and/or schools which had a service line or indoor plumbing fixtures that contained lead. The lead in the service lines and plumbing fixtures would leach into the water due to the water's corrosivity. Ingestion of such water would lead to increased lead exposure, provided that the water was not filtered to remove the lead. Individuals who did not ingest the water would not be exposed.

Dr. Greenberg states that "[t]he potential for exposure in this matter is heterogeneous across the population of Flint and Dr. Weisel does not acknowledge or discuss this fact." I discuss in detail that the water lead concentration varied both temporally and spatially across Flint and therefore the exposure to the population is not uniform. I further indicated that it is necessary for the water to be consumed and the amount of water or foods prepared with the contaminated water will affect the exposure, indicating that the exposure is heterogeneous across the population of Flint.

In summary, the corrosivity of Flint water continued to be present until the water source was changed back to Lake Huron water and additional ortho-phosphate was added after October 2015. This resulted in increased water lead levels as evidenced by the higher values measured in August 2015, prior to the change back, compared to March 2016 after the change back. Even after March 2016, additional time was needed before the WLL were stabilized at a lower value and a policy to replace lead service lines in the community of Flint was enacted to further decrease the water lead levels in homes. Thus, residents who consumed Flint water between April through October 2015, and even beyond that date, had higher lead exposure than they would have had if the original switch had not been made in April 2014 or if the switch back to Lake Huron-sourced water with the addition of ortho-phosphate as a corrosive inhibitor had occurred earlier.

III. CONCLUSION

This ends my rebuttal declaration in response to the declarations of several of the Defendants' witnesses. Each of my opinions are given with a reasonable degree of scientific certainty based upon a preponderance of the evidence.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and recollection.

Executed this 3rd day of March, 2023, in Teaneck, NJ.

By: ______________________

Clifford P. Weisel, M.S. Ph.D.

Citations

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EXHIBIT 1

CSO, SSO, and RTB Discharge from City of Flint 2010-2015

Date	City	County	Event ID	Event	Volume (million gallons)	Discharge Quality	Location	Dumped Into	Reason	Page MDEQ/EGLE Annual Report
4/6/2010	Flint	Genesee	12351	Bypass	8.975	Raw sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	power failure during period of heavy rainfall caused overflow at NW pumping station, later the RTB also overflowed	52 (Bypass-10)
6/19/2010	Flint	Genesee	12559	Bypass	3	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	power failure due to windstorm which affected both power feeds to pump station. Overflowerd to river from pump station wet well.	52 (Bypass-10)
3/5/2011	Flint	Genesee	13000	SSO	0.005	Raw sewage	5900 Block of Western Rd.	n/a	line plugged with grease during period of high flow due to rainfall	227 (SSO-68)
3/22/2011	Flint	Genesee	13077	SSO	5	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	power failure at 3rd Ave pump station (TAPS) due to windstorm with freezing rain and snow. 2 separate power feeds from Consumers Energy failed.	227 (SSO-68)
4/23/2011	Flint	Genesee	13151	SSO	4.11	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	Intense showers resulted in high flows which exceeded treatment and storage capacity	228 (SSO-69)
4/28/2011	Flint	Genesee	13178	SSO	26.65	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	Intense rainfall resulted in high flows which exceeded treatment and storage capacity.	228 (SSO-69)
5/15/2011	Flint	Genesee	13306	SSO	7.7	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	capacity exceeded resulting in overflow due to heavy rainfall	228 (SSO-69)
5/18/2011	Flint	Genesee	13333	SSO	47.8	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	capacity exceeded resulting in overflow due to heavy rainfall	228 (SSO-69)
7/18/2011	Flint	Genesee	13630	SSO	3.9	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	discharge due to loss of both power feeds from Consumers Energy, during warm weather event. Power at WWTP was not impacted.	228 (SSO-69)
7/28/2011	Flint	Genesee	13670	SSO	11.5	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	intense rainfall exceeded capacity of storage and treatment systems.	229 (SSO-70)
1/17/2012	Flint	Genesee	14129	SSO	1.1	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	pump failure due to electrical problem with pump #4	116 (SSO-21)
5/4/2012	Flint	Genesee	14345	SSO	28	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	intense rainfall exceeded capacity of storage and treatment systems.	116 (SSO-21)
1/29/2013	Flint	Genesee	14825	SSO	21.9	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	I/I from heavy rainfall and snowmelt exceeded plant treatment and storage capacity	181 (SSO-40)
4/9/2013	Flint	Genesee	15718	SSO	210	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	extended heavy rainfall and I/I caused capacity of sewer system and RTB to be exceeded.	181 (SSO-40)

4/18/2013	Flint	Genesee	15719	SSO	90	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	I/I from heavy rainfall and snowmelt exceeded plant treatment and storage capacity	181 (SSO-40)
4/19/2013	Flint	Genesee	15720	SSO	3.37	Diluted raw sewage	NW PS at WWTP (influent PS & recycle flow from ash lagoon)	Flint River	overflow due to excessive debris from wet weather clogged pumps	181 (SSO-40)
12/22/2013	Flint	Genesee	15721	SSO	10.6	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	Widespread power failure due to ice storms, both power feeds from utility were lost. Overflow from pump station wet well to river.	181-82 (SSO-40-41)
5/16/2014	Flint	Genesee	17051	SSO	75	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	extended heavy rainfall and I/I caused capacity of sewer system and RTB to be exceeded.	176 (SSO-38)
6/30/2014	Flint	Genesee	17053	SSO	0.001	Partially treated sewage	storm sewer catch basin on WWTP grounds	Flint River	discharge of wwtp sludge due to sludge pump failure	176 (SSO-38)
8/11/2014	Flint	Genesee	16465	SSO	12.3	Partially treated sewage	WWTP RTB, Beecher Rd, outfall 003	Flint River	extended heavy rainfall and I/I caused capacity of sewer system and RTB to be exceeded.	176 (SSO-38)
8/20/2014	Flint	Genesee	17044	SSO	3.75	Raw sewage	3rd Ave Pump Station (TAPS) (Influent pump station to WWTP)	Flint River	discharge due to failure of both power feeds from Consumers Energy. Auto accident was original cause, and CE had a cross connection which resulted in the redundant power source failure.	176 (SSO-38)
8/20/2015	Flint	Genesee	17578	SSO	0.0001	Raw sewage	101 S Dort Hwy	Flint River	backup and overflow of sewer due to restriction cause by restaurant grease	171 (F-30)

Sources:
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2010
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2011
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2012
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2013
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2014
MDEQ Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO) and Retention Treatment Basin (RTB) Discharge Annual Report 2015